



ZEN Blue Graphene Quantum Dots

Graphene Quantum Dots

Graphene Quantum Dots (GQDs) are ultra-small (10-25nm) semiconducting nanocrystals that glow (photoluminesce) at specific wavelengths (i.e. colour) when energy is provided via an ultraviolet light source. The exact colour produced by the GQD depends upon its size. As a result, these nanocrystals can produce distinctive colours by tuning the size of the GQD particles.

GQDs are considered to be a zero-dimensional (0D) nanomaterial and, due to their small size, these nanoparticles have several unique properties:

1. chemically and physically stable
2. large surface to mass ratio;
3. absorb and fluoresce light; and
4. ideal for use as catalysts in some applications.

The Quantum Dot (QD) market is estimated at over US\$6B and forecasted to be US\$30B in 2030, with display devices accounting for the majority. However, the current QDs used in displays contain cadmium, which is an environmentally toxic heavy metal. Governments and industry are developing new non-toxic, biocompatible alternatives.

ZEN Graphene Solutions Ltd. (ZEN) is currently developing high-quality, high fluorescence, high quantum yield GQDs from its unique Albany Graphite source material.

Prof. Kumacheva from the University of Toronto has produced a recyclable material based on nanocellulose and GQDs that were synthesized from ZEN's Albany Graphite. This material was tested for its ability to scavenge heavy metals and was found to scavenge its weight in heavy metals and also demonstrated a particular affinity for mercury. This material has the potential to be very useful for the clean up of mercury-contaminated water (e.g. Grassy Narrows First Nation and the mercury-contaminated English-Wabigoon River system). Prof. Kumacheva's research requires additional funding to continue and ZEN must develop an industrial pathway to produce GQDs.

Through the work at UBC Okanagan (Prof. Arjmand) and the University of Guelph (Prof. Chen), ZEN is working toward commercial sales of GQDs. Once able to commercialize, ZEN plans to continue its collaboration with Prof. Kumacheva's on heavy metal scavenging applications along with investigating other potential GQD markets including displays, photodetectors and conductors for solar cells, catalysts for the hydrogen economy, and medical uses.